PLECS

DEMO MODEL

Buck Converter with Stray IGBT Tail Current

Last updated in PLECS 4.3.1

1 Overview

This demonstration shows a simple unregulated buck converter that models the impacts of stray inductances and an IGBT with tail current.

2 Model

The schematic below shows a simple buck converter using the IGBT with Limited di/dt component. This IGBT model represents the collector current transients during switching, including a finite fall time during turn-off and limited di/dt during turn-on. Since the current is not turned off instantaneously, this IGBT model may be connected in series with a stray inductance, L_2 in this model.

The free-wheeling diode is also modeled as subsystem that represents the dynamics of the diode's reverse recovery characteristic. A stray inductance, L_3 is modeled series with the diode as well.

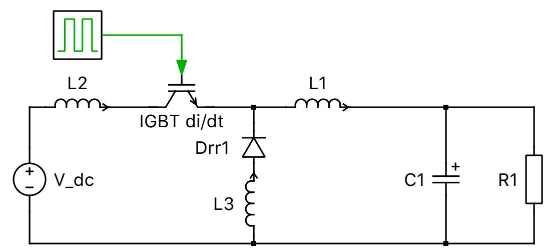

Fig. 1: Buck Converter with Stray IGBT Tail Current

3 Simulation

The simulation shows the over-voltages that stem from the stray inductances and the reverse recovery of the free-wheeling diode. The di/dt limitation during turn-on determines the magnitude of the reverse recovery effect in the free-wheeling diode.

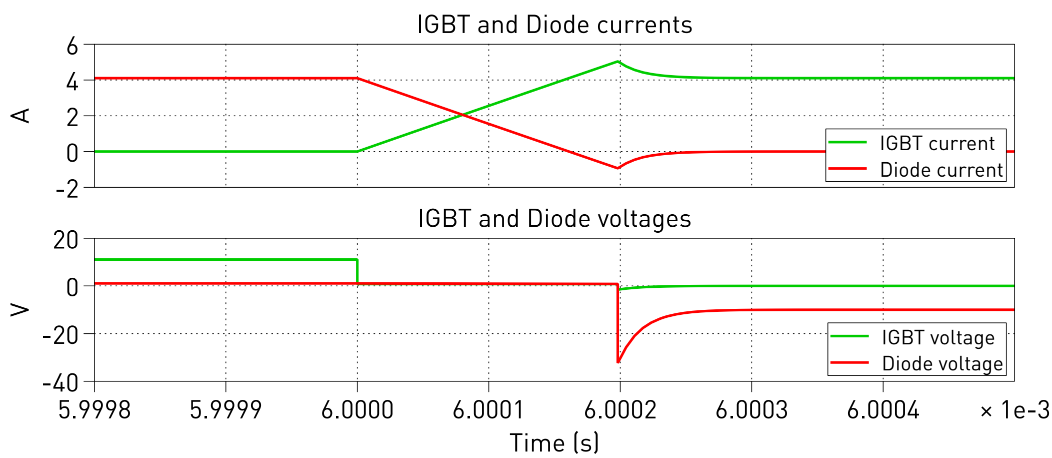

Fig. 2: Voltage and current transients during IGBT turn-on

4 Conclusion

In contrast to the ideal IGBT model that switches instantaneously, this model represents the IGBT transients during switching. With this approach stray inductances may be connected in series with the device. The additional voltage stress due to the diode reverse recovery effect is also modeled.

Revision History:

PLECS 4.3.1 First release

How to Contact Plexim:

☎ +41 44 533 51 00 Phone

+41 44 533 51 01 Fax

✉ Plexim GmbH Mail
Technoparkstrasse 1
8005 Zurich
Switzerland

@ `info@plexim.com` Email

`https://www.plexim.com` Web

PLECS Demo Model